



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2021-0963; Project Identifier AD-2021-01026-T; Amendment 39-21977; AD 2022-06-11]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The FAA is adopting a new airworthiness directive (AD) for certain The Boeing Company Model 777-200 and -300 series airplanes. This AD was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines (“fan blades” are also known as “1st-stage low-pressure compressor (LPC) blades” – these terms are used interchangeably in this AD). This AD requires modifying the engine inlet to withstand fan blade failure event loads. The FAA is issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: For Boeing service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone

562-797-1717; Internet <https://www.myboeingfleet.com>. For Pratt & Whitney service information identified in this AD contact Pratt & Whitney Division, 400 Main Street, East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com; website: <https://connect.prattwhitney.com>. You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195. It is also available at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0963.

Examining the AD Docket

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0963; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The address for Docket Operations is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: Luis Cortez-Muniz, Aerospace Engineer, Airframe Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: (206) 231-3958; email: Luis.A.Cortez-Muniz@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

The FAA issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to certain The Boeing Company Model 777-200 and -300 series airplanes. The NPRM published in the *Federal Register* on December 28, 2021 (86 FR 73688). The NPRM was prompted by reports of three incidents involving

in-flight fan blade failures on certain Pratt & Whitney engines. In the NPRM, the FAA proposed to require modifying the engine inlet to withstand fan blade failure event loads. The FAA is issuing this AD to address the airplane-level implications of the unsafe condition of engine fan blade failure. Fan blade failures can cause fan rotor imbalance and result in fan blade fragments penetrating the inner and outer barrel of the inlet. This condition, if not addressed could result in engine in-flight shutdown, and could result in separation of the inlet, the fan cowl doors, or the thrust reverser (T/R) cowl, or result in uncontrolled engine fire. Separation of the inlet, the fan cowl doors, or the T/R cowl could result in impact damage to the empennage and loss of control of the airplane, or to the fuselage or windows with potential injury to passengers; or it could result in significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude above terrain during extended operations (ETOPS) flights, either of which could result in a forced off-airport landing and injury to passengers. Uncontrolled engine fire could result in loss of control of the airplane.

Discussion of Final Airworthiness Directive

Comments

The FAA received comments from The Air Line Pilots Association, International (ALPA), and two Anonymous commenters who supported the NPRM without change.

The FAA received additional comments from five commenters, including an Anonymous commenter, All Nippon Airways (ANA), Boeing, Japan Airlines (JAL), and United Airlines (UAL). The following presents the comments received on the NPRM and the FAA's response to each comment.

Request to Clarify Certain Sentences in the Background Paragraph

Boeing requested that the "Background" paragraph in the NPRM be revised to clarify that the failed hydraulic pump shutoff valve was not the direct cause of the uncontained engine fire. Boeing stated that flight data indicates that while the hydraulic

pump shutoff valve failed to close, no hydraulic fluid was leaked from the system until well after the engine fire initiated.

Boeing proposed that two sentences in the “Background” paragraph of the NPRM be revised to, “Several flammable fluid lines, the engine accessory gearbox, and T/R structure were fractured *and an uncontained engine fire occurred*. The hydraulic pump shutoff valve failed to close when the fire handle was pulled, contributing additional flammable fluid to the *T/R area*.” Boeing commented that the proposed wording recognizes that the failure may have contributed additional flammable fluid to the T/R area, but that it did not directly cause the uncontained fire.

The FAA agrees with the commenter’s clarification and did not intend to imply that the failed hydraulic pump shutoff valve was the direct cause of the uncontained engine fire. However, the detailed background information, which includes the sentences that the commenter proposed for the “Background” paragraph, are not carried over into the final rule. The FAA has not changed this final rule in this regard.

Request to Use Certain Service Information as a Method of Compliance

ANA, an Anonymous commenter, Boeing, and UAL requested the use of Boeing Alert Service Bulletin 777-71A0085 and Boeing Alert Service Bulletin 777-71A0093, for doing the actions in paragraph (g) of the proposed AD. Boeing stated that the description of the modification in the proposed AD is vague.

The FAA disagrees with allowing the use of Boeing Alert Service Bulletin 777-71A0085 and Boeing Alert Service Bulletin 777-71A0093 for the actions specified in paragraph (g) of this AD. The service bulletins are not yet FAA-approved. However, under the provisions of paragraph (j) of this AD, the FAA will consider requests for approval of the use of the service bulletins if sufficient data are submitted to substantiate that the service bulletins would provide an acceptable level of safety.

Request to Add Certain Exceptions for Ferry Flights

JAL requested that the FAA revise the AD to include certain exceptions for ferry flights. JAL stated it is planning to ferry affected airplanes to a storage point in the United States. JAL commented that although the local authority in Japan provides regulatory requirements for special flight permissions which are similar to 14 CFR 21.197, the Japanese regulatory requirements do not include “to a point of storage” language for the purpose of the flights. JAL proposed to add the following wording to paragraphs (c) and (g) of the proposed AD, “except for ferry flights, without passenger and cargo, of the airplanes on which the actions specified in paragraphs (h)(1) and (2) of this AD have been done.”

The FAA disagrees with revising paragraph (c) Applicability or paragraph (g) Modification of this AD in response to JAL’s comment. Paragraph (i), Special Flight Permit, provides that special flight permits, as described in 14 CFR 21.197 and 21.199, are permitted provided that the actions in paragraphs (h)(1) and (2) of this AD have first been accomplished. 14 CFR 21.197(a)(1) provides, in relevant part, that a special flight permit may be issued for flying the aircraft to a base where repairs, alterations, or maintenance are to be performed, or to a point of storage. The requested change is already permitted by this AD. The FAA did not change this AD as a result of this comment.

Request to Change the Initial Compliance Time to Before Revenue Flight

ANA requested that in paragraph (g) of the proposed AD, the FAA update the initial compliance time of “before further flight after the effective date of this AD” to “before the next revenue flight” to clarify the ferry flight requirement.

Similarly, JAL requested that in paragraph (g) of the proposed AD, the FAA update the initial compliance time of “before further flight after the effective of this AD”

to “before the next revenue flight” or “before further flight except the ferry flight without passenger and cargos.”

The FAA disagrees with revising the initial compliance time in paragraph (g) of this AD as requested by ANA and JAL. The FAA has determined it is necessary to require certain actions prior to any flight, except as permitted in paragraph (h), Special Flight Permit, of this AD.

Request to Provide a Threshold for the Special Flight Permit

UAL requested that the FAA provide a threshold in paragraph (h)(1) of the proposed AD for the flow path UT inspection. UAL stated that omitting a compliance time in paragraph (h) of the proposed AD for the special flight permits creates ambiguity regarding when and how often the flow path UT inspection is required for special flight permits. UAL suggested a threshold of 275 flight cycles since the last flow path UT inspection.

The FAA agrees to add a threshold of 275 cycles to paragraph (h)(1) of this AD, which is specified in Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021. This allows airplanes with 1st-stage LPC blades that have accumulated 275 cycles since new or fewer to be eligible for a special flight permit.

Request for an Additional Method of Compliance

UAL requested that the FAA revise paragraph (h)(1) of the proposed AD to add NPRM AD-2021-00830-E (86 FR 73699, December 28, 2021), as a method of compliance for the flow path ultrasonic testing (UT) inspection of the 1st-stage LPC blades.

The FAA disagrees with the commenter’s request. The method of compliance in Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, is the same as paragraph (i)(1) of NPRM AD-2021-00830-E (86 FR 73699, December 28, 2021) and paragraph (h)(1) of this AD. If the actions in the service information are

accomplished, the requirements in paragraph (h)(1) of this AD will have been met, and therefore, no change to this AD has been made.

Request to Add Aircraft Maintenance Manual Task to Special Flight Permit

ANA and UAL requested that paragraph (h)(2) of the proposed AD include Task 29-11-00-710-806 of the Boeing 777-200/300 Aircraft Maintenance Manual as an acceptable method for accomplishing the functional check of the left and right hydraulic pump shutoff valves.

The FAA agrees with the commenter's request and has added Task 29-11-00-710-806 of Boeing 777-200/300 Aircraft Maintenance Manual to the "Other Related Service Information" paragraph and to Note (1) to paragraph (h)(2) of this AD as guidance for accomplishing the actions required by paragraph (h)(2) of this AD.

Request to Delegate Alternative Methods of Compliance (AMOCs)

UAL requested that if Boeing Alert Service Bulletin 777-71A0085 and Boeing Alert Service Bulletin 777-71A0093 become an FAA-approved method of compliance, the FAA should delegate The Boeing Company Organization Designation Authorization (ODA) authority to approve structural related AMOCs when deviations to the service documents are required.

The FAA acknowledges UAL's request, however as stated previously, the Boeing service bulletins are not yet FAA-approved, and therefore ODA authority is not granted at this time. In the future, should the service bulletins be approved as a method of compliance to this AD, the FAA may consider ODA authority delegation for approval of structural-related AMOCs for deviations to the approved method of compliance.

Additional Change Made to This AD

In the process of preparing this final rule, the FAA noticed that the unsafe condition statement could be improved regarding the initial effects of the fan blade failure and the airplane level unsafe outcomes that could result from each of those initial

effects. Therefore, the FAA has updated the unsafe condition statement in this AD to clarify the specific causes and hazardous effects.

Conclusion

The FAA reviewed the relevant data, considered any comments received, and determined that air safety requires adopting this AD as proposed. Except for minor editorial changes, and any other changes described previously, this AD is adopted as proposed in the NPRM. None of the changes will increase the economic burden on any operator.

Related Service Information under 1 CFR Part 51

The FAA reviewed Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021. This service information specifies procedures for performing thermal acoustic image and ultrasonic testing inspections of 1st-stage LPC blades. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in ADDRESSES.

Other Related Service Information

The FAA reviewed Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022, and Task 29-11-00-710-806, of Boeing 777-200/300 Aircraft Maintenance Manual, dated September 5, 2021. The service information specifies procedures for performing a functional check of the engine-driven pump shutoff valve.

Interim Action

The FAA considers this AD to be an interim action. The manufacturer is currently developing other actions that will address the unsafe condition identified in this AD. Once these actions are developed, approved, and available, the FAA might consider additional rulemaking.

Costs of Compliance

The FAA estimates that this AD affects 54 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

| Estimated costs | | | | |
|-----------------|---|------------|------------------|------------------------|
| Action | Labor cost | Parts cost | Cost per product | Cost on U.S. operators |
| Modification | 660 work-hours X \$85 per hour = \$56,100 | \$362,560 | \$418,660 | \$22,607,640 |

The FAA has received no definitive data on which to base the cost estimates for the on-condition repairs that are part of the modification specified in this AD.

Authority for this Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the

national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

(1) Is not a “significant regulatory action” under Executive Order 12866,

(2) Will not affect intrastate aviation in Alaska, and

(3) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

The Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new airworthiness directive:

2022-06-11 The Boeing Company: Amendment 39-21977; Docket No. FAA-2021-0963; Project Identifier AD-2021-01026-T.

(a) Effective Date

This airworthiness directive (AD) is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) Affected ADs

None.

(c) Applicability

This AD applies to The Boeing Company airplanes, certificated in any category, as specified in paragraphs (c)(1) and (2) of this AD.

(1) Model 777-200 series airplanes equipped with Pratt & Whitney PW4074, PW4074D, PW4077, PW4077D, PW4084D, PW4090, and PW4090-3 model turbofan engines.

(2) Model 777-300 series airplanes equipped with Pratt & Whitney PW4090 and PW4098 model turbofan engines.

(d) Subject

Air Transport Association (ATA) of America Code 54, Nacelles/pylons.

(e) Unsafe Condition

This AD was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines. The FAA is issuing this AD to address engine fan blade failure, which could result in engine in-flight shutdown, and could result in separation of the inlet, the fan cowl doors, or the thrust reverser (T/R) cowl, or result in uncontrolled engine fire. Separation of the inlet, the fan cowl doors, or the T/R cowl could result in impact damage to the empennage and loss of control of the airplane, or to the fuselage or windows with potential injury to passengers; or it could result in significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude above terrain during extended operations (ETOPS) flights, either of which could result in a forced off-airport landing and injury to passengers. Uncontrolled engine fire could result in loss of control of the airplane.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Modification

Before further flight after the effective date of this AD, modify the engine inlet to withstand fan blade failure event loads, in accordance with a method approved by the Manager, Seattle ACO Branch, FAA.

(h) Special Flight Permit

Special flight permits, as described in 14 CFR 21.197 and 21.199, are permitted provided that the actions in paragraphs (h)(1) and (2) of this AD have first been accomplished.

(1) A flow path ultrasonic testing (UT) inspection of the 1st-stage low-pressure compressor (LPC) blades for cracking has been done within the last 275 cycles, as specified in the Accomplishment Instructions, Part A – Initial Inspection of All LPC Fan Blades Prior to their Return to Service, paragraph 1.A., of Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, and the 1st-stage LPC blades have been found serviceable. This inspection is not required for 1st-stage LPC blades with 275 cycles since new or fewer.

(2) A functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the corresponding engine fire handle input and all applicable corrective actions (i.e., repair) within 10 days prior to flight.

Note (1) to paragraph (h)(2): Guidance for accomplishing the actions required by paragraph (h)(2) of this AD can be found in the “Engine-Driven Pump (EDP) Shutoff Valve Check” (Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022, or Task 29-11-00-710-806) of Boeing 777-200/300 Aircraft Maintenance Manual.

(i) Credit for Previous Actions

This paragraph provides credit for the actions specified in paragraph (h)(1) of this AD, if those actions were performed before the effective date of this AD using the service information specified in paragraph (i)(1), (2), or (3) of this AD.

(1) Paragraph 2. of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 85F-21, dated May 12, 2021, for a flow path UT inspection.

(2) Paragraph 1.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, dated July 1, 2021, for a flow path UT inspection.

(3) Paragraph 2.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, Revision A, dated July 28, 2021, for a flow path UT inspection.

(j) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle ACO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (k)(1) of this AD. Information may be emailed to: 9-ANM-Seattle-ACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(k) Related Information

(1) For more information about this AD, contact Luis Cortez-Muniz, Aerospace Engineer, Airframe Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: (206) 231-3958; email: Luis.A.Cortez-Muniz@faa.gov.

(2) Service information identified in this AD that is not incorporated by reference is available at the addresses specified in paragraphs (l)(3) and (4) of this AD.

(l) Material Incorporated by Reference

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021.

(ii) [Reserved]

(3) For Boeing service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet <https://www.myboeingfleet.com>. For Pratt & Whitney service information identified in this AD contact Pratt & Whitney Division, 400 Main Street, East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com; website: <https://connect.prattwhitney.com>.

(4) You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195.

(5) You may view this service information that is incorporated by reference at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, fr.inspection@nara.gov, or go to: <https://www.archives.gov/federal-register/cfr/ibr-locations.html>.

Issued on March 4, 2022.

Lance T. Gant, Director,
Compliance & Airworthiness Division,
Aircraft Certification Service.

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